


1. Suppose you push 10, 20, 30, and 40 onto the stack. Then you pop three items. Which one is left on the stack?
2. Which of the following is true?
 - a. The pop operation on a stack is considerably simpler than the remove operation on a queue.
 - b. The contents of a queue can wrap around, while those of a stack cannot.
 - c. The top of a stack corresponds to the front of a queue.
 - d. In both the stack and the queue, items removed in sequence are taken from increasingly high index cells in the array.
3. What do LIFO and FIFO mean?
4. True or False: A stack or a queue often serves as the underlying mechanism on which an ADT array is based.
5. Assume an array is numbered with index 0 on the left. A queue representing a line of movie-goers, with the first to arrive numbered 1, has the ticket window on the right. Then
 - a. there is no numerical correspondence between the index numbers and the movie-goer numbers.
 - b. the array index numbers and the movie-goer numbers increase in opposite left-right directions.
 - c. the array index numbers correspond numerically to the locations in the line of movie-goers.
 - d. the movie-goers and the items in the array move in the same direction.
6. As other items are inserted and removed, does a particular item in a queue move along the array from lower to higher indices, or higher to lower?
7. Suppose you insert 15, 25, 35, and 45 into a queue. Then you remove three items. Which one is left?
8. True or False: Pushing and popping items on a stack and inserting and removing items in a queue all take $O(N)$ time.
- 9- Write a program that implements the Stack class based on an array of predetermined size. Methods Push, Pop and Peek should be implemented as well.

1. Computer sorting algorithms are more limited than humans in that
 - a. humans are better at inventing new algorithms.
 - b. computers can handle only a fixed amount of data.
 - c. humans know what to sort, whereas computers need to be told.
 - d. computers can compare only two things at a time.
2. The two basic operations in simple sorting are _____ items and _____ them (or sometimes _____ them).
3. True or False: The bubble sort always ends up comparing every item with every other item.
4. The bubble sort algorithm alternates between
 - a. comparing and swapping.
 - b. moving and copying.
 - c. moving and comparing.
 - d. copying and comparing.
5. True or False: If there are N items, the bubble sort makes exactly N^2 comparisons.
6. In the selection sort,
 - a. the largest keys accumulate on the left (low indices).
 - b. a minimum key is repeatedly discovered.
 - c. a number of items must be shifted to insert each item in its correctly sorted position.
 - d. the sorted items accumulate on the right.
7. True or False: If, in a particular sorting situation, swaps take much longer than comparisons, the selection sort is about twice as fast as the bubble sort.
8. A copy is _____ times as fast as a swap.
9. What is the invariant in the selection sort?
10. In the insertion sort, the "marked player" described in the text corresponds to which variable in the `insertSort.java` program?
 - a. `in`
 - b. `out`
 - c. `temp`
 - d. `a[out]`

11. In the insertion sort, “partially sorted” means that
 - a. some items are already sorted, but they may need to be moved.
 - b. most items are in their final sorted positions, but a few still need to be sorted.
 - c. only some of the items are sorted.
 - d. group items are sorted among themselves, but items outside the group may need to be inserted in it.
 12. Shifting a group of items left or right requires repeated _____.
 13. In the insertion sort, after an item is inserted in the partially sorted group, it will
 - a. never be moved again.
 - b. never be shifted to the left.
 - c. often be moved out of this group.
 - d. find that its group is steadily shrinking.
 -  In object-oriented programming, an object
 - a. is a class.
 - b. may contain data and methods.
 - c. is a program.
 - d. may contain classes.
 6. A class
 - a. is a blueprint for many objects.
 - b. represents a specific real-world object.
 - c. will hold specific values in its fields.
 - d. specifies the type of a method.
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Modify the `insertionSort()` method in `insertSort.C` so it counts the number of copies and the number of comparisons it makes during a sort and displays the totals.

How many times would you need to traverse a singly linked list to delete the item with the largest key?

Which do you think would be a better choice to implement a stack: a singly linked list or an array?

A) True or false:

- Data can be retrieved from the QUEUE in LIFO order
- ↯ Data can be retrieved from the STACK in FIFO order
- ↯ An algorithm is a procedure for solving a problem in terms of the actions to execute and the order in which these action execute
- The binary search is faster than the sequential search.
- In the selection sort, the largest keys accumulate on the left
- In the selection sort, a number of items must be shifted to insert each item in its correctly sorted position
- In the selection sort, the sorted items accumulate on the right.
- ↯ In the bubble sort, higher values float to the right whereas lower values float to the left.
- The new items are always added to the top of the queue.
- ↯ The pop, push and peek operations have the same effect on the stack's size.
- In the insertion sort, after an item is inserted, it will never be shifted to the left.

B) Write an application that calculates the value of π from the infinite series

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \dots$$

C)

If $X = \sum_{i=0}^5 c$ find value of X for c=4

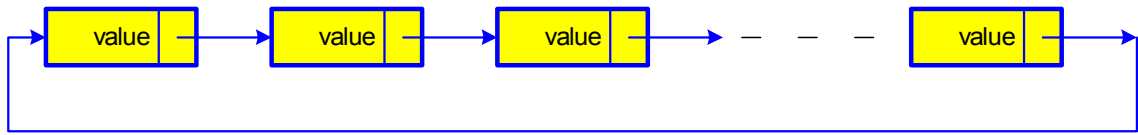
If $Y = \sum_{i=0}^5 i$ find value of Y

If $Z = \sum_{i=1}^4 i^2$ find value of Z

Prove that :

$$\sum_{i=0}^{n-1} i = \frac{n(n-1)}{2}$$

- D) Write code segment that establishes a circular linked list where each element points to the next one:**



- E) 1. In the insertion sort, after an item is inserted, it will
- never be moved again.
 - never be shifted to the left. ok
 - never be shifted to the right.
 - be swapped with the next item.

Write the result of executing the following program:

```
using System;
using System.Collections;
using System.Collections.Generic;
using System.Text;

namespace exam
{
    class test
    {
        static void Main(string[] args)
        {
            Stack stack5 = new Stack();

            for(int i=1; i <= 5; i++)
            {
                stack5.Push(i);
            }
            for(int i=1; i <= 5; i++)
            {
                Console.WriteLine(stack5.Peek());
            }
            for(int i=1; i <= 5; i++)
            {
                Console.WriteLine(stack5.Pop());
            }
        }
    }
}
```